Frankly Speaking

On Your Mark!

AMERICA stands on the threshold of the post-war period. Our industries started the war production race with the Axis with a decided handicap, but already some of America's entries have caught up with and passed the enemy pack. Some, we are told, are so far ahead that they have energy to spare.

Talk prevails of an early resumption of some civilian goods—not a lot, but some. The war is *not* ended by any means, but the post-war is apparently setting in.

The time is ripe to look to today's tasks with tomorrow's problems in mind.

The post-war period is not very likely to be ushered in with one big bang and neither will the war end that way. In fact, the post-war readjustment period may be plural, coinciding with and arriving as a series of stages or knockouts for our separate enemies. In short, that nebulous, indefinable post-war period is not a remote contingency but a present-day reality.

Be ready! *On your mark,* Traffic Engineers! Remember that an adequate and functional system of motorways, parkways and highways is as important to a healthy community condition as the free circulation of blood in healthy arteries is to the human body.

Urge thoroughfare plans *now* on the basis of physical need and community-wide usefulness. And, when I say community-wide, I mean community in its broadest sense—city, state and nation. Let's build inspiringly in the future. Let's not tolerate roads for relief. Surely, America needs roads and American fighting men will need jobs. How long shall jobs on needed projects be considered relief? A traffic improvement which will save lives, reduce accidents and enable the returning soldier and his family to go farther in less time, would, in the editor's humble opinion, be more in keeping with the spirit and wishes of those Americans dead and dying on foreign battlefields than elaborate Post-War Public Squares and Monuments erected in their memory.

Education, Enforcement, and Engineering, have been the watchwords of traffic administrators in pre-war days.

The traffic engineer of the future will be called upon to broaden his horizon and develop into a post-war traffic planner with Economy, Efficiency and Employment, by-words of his engineering equipment.

Leslie Williams

Editor, Traffic Engineering

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STREET LIGHTING SAFETY STANDARDS

The Board of Directors of the Institute of Traffic Engineers recently voted full approval of the action taken by the chairman and members of the Institute's Street and Highway Lighting Committee as contained in the following letter to the Office of War Utilities, Mr. J. A. Krug, Director:

Mr. J. Krug, Director
Office of War Utilities
Washington, D. C.
Dear Sir:

We have been informed that it is probable that an order may be issued to effect a nation-wide brownout or dimout. The Institute of Traffic Engineers is very much interested as to the effect such an order would have on night traffic safety, to say nothing of safety from attack and robbery of the many workers, especially women, who use the streets during the late night and early morning hours in these war days and also the protection of property and equipment against sabotage.

In 1940 the Street and Highway Lighting Committee of the Institute of Traffic Engineers cooperated with a similar committee of the Illuminating Engineering Society in establishing minimum values of illumination for night traffic safety. These values were published in that year by the latter society in a pamphlet under the heading of "RECOMMENDED PRACTICE OF STREET LIGHTING". Shortly thereafter they were included in the Traffic Engineering Handbook and are accepted by the Institute of Traffic Engineers as the authoritative guide in the matter of street lighting in relation to traffic safety.

It would be our thought on this matter that unless other factors completely outweigh the considerations enumerated in the first paragraph above, that street and highway lighting be not reduced below the values given in these tables and accepted by the Institute of Traffic Engineers as their standard and guide as the minimum requirements for street and highway lighting.

These recommendations establish a definite relationship between traffic volumes and street lighting intensities which automatically would take into account any changes in traffic conditions whatever they might be.

Without the guidance of some recognized standards, much harm can be done by indiscriminate curtailment, just to do something.

Respectfully submitted,

HOWARD F. ILGNER, *Chairman,*
For and with the Unanimous Approval
of the
Street and Highway Lighting Committee
Institute of Traffic Engineers

Members of the Committee
HOWARD F. ILGNER, *Chairman*

NATHAN AVINS — HENRY W. OSBORNE — WILLIAM G. ELIOT, 3D
ALGER F. MALO — EARL J. REEDER — JOHN L. TOWERS
CHARLES H. REX — JOSEPH LAMAR WEHMEYER

The Board of Directors highly commended the committee for its initiative in handling this matter, for it felt that action of this nature indicated the forward point of view and that similar action should be taken by other Institute Committees whenever the need arises.

RAILROAD CROSSING PROTECTION

by ROGER L. MORRISON

IN their efforts to reduce accidents, traffic engineers and police officials are often handicapped by the ill-advised demands of well-meaning but uninformed persons who have sufficient authority, or influence, to force the adoption of inefficient or ineffective methods. In no field of traffic engineering, however, does scientific analysis so frequently give way to public emotion as in railroad crossing protection.

The general public, although comparatively indifferent to the daily slaughter of men, women and children on its streets and highways, will suddenly become so excited over one spectacular railroad crossing accident that they will demand the immediate expenditure of a large sum of money to eliminate the crossing which happens to be the scene of the accident, even though the same sum, or even a much smaller one, spent in some other way, at a number of different places, would save many more lives.

In Michigan recently a bus accident in Hamtranck caused the death of 16 persons. This was the only fatal accident which had occurred at this crossing in nine years, and it was apparently caused by the crowded condition of the bus rather than by any particular hazard of the crossing; but it resulted in a widespread demand for the elimination of the crossing. There are no estimates at hand, but it is possible that half the grade crossings in the Detroit area could be protected with automatic gates for less than the elimination of this one crossing would cost.

Let us take another example, this one in Detroit. About seven years ago there was a rather spectacular fatal accident at one of the two railroad crossings near John R Street and Seven-Mile Road. Several other persons had been killed at these crossings in previous years and the newspapers were full of demands for the elimination of these "death traps." This was accomplished, at high cost, and everyone was apparently satisfied.

If we "look at the record," we find that during the five year period from 1931 to 1935 inclusive, trains at these two crossings killed 7 persons, injured 6 persons and caused 1 non-injury accident.* At the same time there were 35 crossings "protected" with center-type flashing signals and during 1934 and 1935 alone, 13 persons were killed and 173 were injured due to vehicles hitting the bases of these signals. Records are not at hand for 1931, 1932 and 1933, but if the same accident rate is assumed, the total for the five years would be about 30 killed, 430 injured and 120 non-injury accidents.

If my memory is correct, the grade separations cost $700,000 and the replacement of all the center type signals would have cost $35,000, or one-twentieth as much for an estimated 600 accidents in 5 years as was actually spent where there were only 14 accidents in 5 years! At the end of another 5 years, 18 of the center-type signals were still taking their annual toll.

Another interesting item was that in 1935 there were 25 persons killed or injured by hitting the center piers of railroad grade-separations compared to 47 killed or injured by trains. This situation has been greatly improved since 1935 by flood-lighting and other measures.

It is probable that every grade separation in Detroit is justified as a means

*Detroit statistics used in this paper were furnished by the Police Department in 1936.

of eliminating traffic delays and congestion, but from the standpoint of life saving it is doubtful if there is any other way in which so much money is spent to accomplish so little. Or, putting it another way, if a given amount of money is available for reducing traffic accidents, that is usually the least effective way of spending it.

Detroit has been used for illustration only because it is in Michigan and because certain Detroit data were at hand when this paper was written, but the emotional spending of large sums of money because of a single spectacular accident is a nation-wide practice. In fact, it was only a few years ago that the Federal Government appropriated $800,000,000 for grade-separations as a result of one school-bus accident. This was sufficient for perhaps 2000 to 3000 separations, or about one percent of the total, but that sum, if used otherwise, might have furnished efficient protection for all of the important railroad crossings in America.

The question arises, then, as to what *is* the most efficient type of crossing protection. About seven years ago, I attempted to find the answer to that question, but definite statistical data were very scarce. In fact, a search through available literature resulted in finding only one article giving statistical data from which any definite conclusions could be drawn. That was "Railway Crossings Need Protection," by J. R. Blackhall, presented at the National Safety Congress and published in the December 1933 issue of "National Safety News."

Mr. Blackhall, who was Manager for the Receivers of the Chicago North Shore and Milwaukee Railroad Company, gave a detailed analysis of accidents at 187 crossings, some of which were protected with manual gates, some with automatic gates, some with visible and audible signals, and some with signs only. The study covered a period of 3½ years and took into consideration the volumes of railroad and highway traffic. The conclusions might be summarized in the following quotation, "If we regard each vehicle crossing the track as an accident possibility, we find that our gate-protected crossings are 22 times as safe as the signal protected crossings, and are 100 times as safe as the crossings equipped only with warning signs."

Another article stated that at 6 crossings in a city, gates had been replaced with side-type signals, at a material saving to the railroad. The exact number of accidents was given for a two-year period preceding the change and a decrease was predicted. As several years more had elapsed when I saw the article, it looked like an ideal "before and after" test. However, when I wrote to the railroad officials they replied that they had no information to give me. I could not help but wonder if their reticence was due to an increase, rather than a decrease, in accidents following the abandonment of the gates for the lower-cost signals.

An analysis was made for the years 1934 and 1935 of all grade crossing accidents in Detroit. Of the 282 crossings, 112 had signs only, two had "track" gates, and 14 had no protec-

ACCIDENTS IN 1934 AND 1935

Protection	*No. of Crossings*	*Hit by Trains*			*Hit Signals or Gates*			*Total Accidents*		
		F	*I*	*NI*	*F*	*I*	*NI*	*F*	*I*	*NI*
Center Signals	35	8	5	2	13	173	48	21	178	50
Side Signals	76	7	15	3	1	2	4	8	17	7
Crossing Gates*	36	1	2	3	0	7	15	1	9	18
Watchmen	77	0	2	0	0	0	0	0	2	0
Total	154	16	24	8	14	182	67	30	206	75

F = Persons killed; I = Persons injured; NI = Non-injury accidents.

*Some crossings apparently had both gates and watchmen.

Three other persons were killed but the accident locations were not stated.

tion. There were no accidents at all at the "track gate" and "no protection" crossings, and there were only 2 persons killed and 10 injured at the 112 "sign" crossings. Apparently these 128 crossings were all rather unimportant. The remaining 154 crossings were protected by signals, crossing gates or watchmen.

The above comparison takes no account of the traffic volume of trains or vehicles, but crossing accidents do not necessarily vary directly with either the railroad or vehicle traffic volumes, at least not with vehicle volumes. For instance, during a 5 year period, 6 of the 43 persons killed or injured by trains at Grand Trunk Railway Crossings were in accidents at 5 crossings with average traffic volume of only 562 vehicles daily, while 9 other crossings with an average daily volume of 10,293 vehicles had no accidents at all in the 5 years. The number of trains was about the same at most crossings. Six of the 43 persons were killed or injured at gate-protected crossings and 37 at crossings with signals. Eight of the nine no-train-accident, heavy traffic crossings, had gates.

Attempts to correlate accidents with railroad and vehicle traffic volume are complicated by various factors. In the Grand Trunk study, two of the four persons killed at the 15 gate-protected crossings were pedestrians who presumably crossed when the gates were down, and of course, these accidents had no relation to vehicle volumes. Also, the tabulations give the number of persons killed rather than the number of fatal accidents, although it is the number of accidents which measure the hazard. The recent bus crash would be tabulated as 16 fatalities, with the same weight as sixteen accidents with one fatality each, although it was only one accident. This is not a criticism of the method of tabulating but shows the difficulty of using tables for this particular purpose. Another complication is that one freight train switching over a crossing at 5 miles an hour is certainly not the same hazard as one express train crossing at 50 miles an hour. For these reasons, my studies in Detroit in 1936 were not conclusive but all the evidence indicated that crossing gates give more effective protection than signals.

Similar evidence is given in the reports of the Interstate Commerce Commission for the years 1940 and 1941 which list all rail-highway accidents in the United States, involving motor vehicles.

In 1940 there were 5 accidents due to failure of gates and 4 due to failure of other protection. The corresponding figures for 1941 were 3 and 4. Presumably most of the gates were manually operated. The figures of accidents per 1000 watchman-protected crossings is of doubtful significance. At about half the crossings the watchman is on duty only part time and there are other questionable factors. The group marked "Signs, etc." includes unprotected crossings and probably the average traffic is very small. The most significant figure is the comparison of gates and signals, with about four to seven times as many accidents per 1000 signal-protected crossings as per 1000 gate-protected crossings. With all the crossings of each type in the United States included, the accident ratio should give a reasonably fair index of efficiency.

At our 1937 Highway Conference, Warren G. Henry, Assistant Chief Engineer of the Illinois Commerce Commission, gave a paper on "The Efficiency of Various Types of Railway Crossing Protection" which is the most complete discussion of the subject which I have seen. Among other things he showed the advantages of automatic gates, extending only across the right

Type of Protection	No. of accidents 1940	1941	No. crossings Dec. 31, 1940	Accidents per 1000 crossings 1940	1941
Lowered gates	30	32	4,025	7½	8
Watchmen	144	143	4,949	29	29
Audible and Visible Signals	439	438	11,711	37	37
Audible Signals	125	118	2,956	41	40
Visible Signals	426	488	8,578	50	57
Signs, etc.	2,403	2,532	197,159	12	13
Total	3,567	3,751	229,378		

half of the pavement, and combined with a visible and audible signal. Thus vehicles cannot get caught between the gates. These are illuminated with three electric lights on each arm.

I have seen no analyses of the efficiency of other automatic devices, such as the "auto-stop," so have necessarily confined this discussion to gates and signals.

One objection to automatic gates has been that they may cause unnecessary delays when actuated by slow trains. This difficulty has been overcome, in some cases at least, by time control systems which lower the gates a shorter distance ahead of a slow train than a fast one.

The only data I have as to the reliability of automatic gates is contained in a letter from an engineer on a railroad with more than 50 such gates, some of them having been in operation about nine years when the letter was written. This letter was as follows:

"In regard to operating interruptions, complete records have been kept of all interruptions to operation and an analysis of these records indicates that interruptions are of two classes—those affecting the gate operation, and those generally not affecting the operation of the gates. The first classification is still further divided as to interruptions due to the gates themselves, interruptions due to track control circuits, and interruptions due to outside influences over which the railroad has no control. As a result of this analysis the following efficiency results have been computed.

"The efficiency of the gates themselves indicate an average of 35,700 single gate pedestal operations per single interruption or 1.1 interruptions per gate pedestal per year. The efficiency of the entire gate installations including the gates, track control circuits, and all other outside influences indicates an average of 6,867 complete crossing operations as a whole per single interruption or 3.3 interruptions per crossing per year.

"These gates are equipped with bells, and flashing light protection on the gate arm, and at no time has there ever been a failure of all functions at any one crossing. In other words, for every train operation some portion of the protection (barrier, flashing light, or bell) has functioned at all times.

"Referring to the efficiency of the operation, a careful record kept as to maintenance, power and conservative estimates of depreciation together with the interest on investment indicates a saving over manually operated gates of an amount which returns approximately 40% annually on the investment made in these automatic gate installations."

In this discussion, I have presented the available evidence, from my own investigations, from official reports and from the statements of other investigators, as to the comparative efficiency of various widely-used protective devices. This evidence indicates that gates give better protection than signals and that automatic gates are cheaper and probably more efficient

than manual gates. The high cost of the latter apparently is the cause of railroad officials' preference for signals. The best type of automatic gate seems to be the one combined with visible and audible signals and with the gate barring only the right half of the pavement. Some other and newer device may be more efficient, but I have no evidence one way or the other as to that.

Unfortunately in Michigan there is a legal restriction which prevents the general adoption of more efficient crossing protection. Previous to 1931 the Public Utilities Commission was free to order the installation of any type of crossing protection which seemed to the Commission to be most desirable in any given location, but Act No. 336 of the Public Acts of 1931 took away all discretion as to types of protective devices. The Commission now has authority only to order the installation of side-type flashing signals.

The proper first step toward the saving of lives at Michigan railroad crossings appears to be, not the spending of enormous sums for a very few grade separations, but the repeal of this restrictive law, so that the most efficient types of crossing protection can be installed.

Condensed from a paper by Professor Roger L. Morrison (Mem. I.T.E.), presented at the 1943 Michigan Highway Conference, Ann Arbor, Michigan.

THE CITY'S PLACE IN POST-WAR HIGHWAY PLANNING

by THOMAS H. MACDONALD

PLANNING for after-the-war highway construction is now in progress in several states under provisions of the Defense Highway Act of 1941. All states are to be included in the planning program. Federal-aid funds totaling $10,000,000, have been apportioned for this work which includes surveys, preparation of plans, specifications, and all other incidentals short of actual letting of the contract.

Under the terms of the 1941 legislation and by express understanding with the states, none of the highway projects for which the advance planning is under way will be constructed until after the conclusion of the war.

In the approval of projects selected by the states, the Public Roads Administration is giving preference to those that will result in wholly adequate traffic facilities in urban or metropolitan areas, including city entrance routes, circumferential and distribution routes, and terminal and publicly owned off-street parking facilities.

The act states among other provisions, that "by agreement with the state highway department of any state, any project carried out in such state under the provisions of this section (on surveys and plans) may be carried out through or in cooperation with the highway department in such state." Since it has always been the policy of the Public Roads Administration to work with and through the state highway departments, the advance planning activities are being carried out in the manner suggested by the law.

Cities interested in taking advantage of this specific planning of traffic facilities should, therefore, apply to their respective state highway departments. Since by law the federal contribution to advance planning of post-war construction must be matched by state funds before it becomes expendable, cities may find it advantageous to indicate their willingness to provide at least a part of the state's contribution

for the particular projects they propose. Cities may also find it productive to offer the services of their engineering staffs in planning the desired facilities.

In recommending planning projects, city officials need to keep in mind that no proposal will be approved in which the planning operation involves only such studies, processes, decisions, and volume of detail as are required for ordinary highway construction projects. In this advance-planning activity, it is assumed that normal improvements will be undertaken again after the war in the regular, continuing federal-aid program. *Advance planning under the 1941 legislation applies only to projects for out-of-the-ordinary improvements of such magnitude as to justify and require considerable time and study.*

From city, state, and national standpoints, advance planning of projects for post-war construction is important. It will make available a reserve of well-planned and essential public works projects which can be put under construction to provide immediate and useful employment during the period when the armed forces are demobilizing, war plants closing down, and industry converting from wartime to peacetime production.

The $10,000,000 federal appropriation for advance planning, plus an equal amount of matching state money, provides a fund sizable enough to project a $500,000,000 post-war highway building program. This is equivalent to about two years of pre-war federal aid highway construction. The planning for this pre-war program was a continuous process. In general, while one road was being built, another was being planned. Few people not engaged in construction work realize the amount of time it would take to prepare plans for extensive post-war highway improvements if the planning had to start from scratch at the end of the war. The Public Roads Administration has already approved planning projects in or near more than 25 cities, including Boston, New York, Kansas City, St. Louis, and San Francisco.

One of the most essential elements in the construction of an adequate interregional system will be the routing of express highways directly into and through the centers of our big cities. This is recognized in the advance planning in progress for several cities. The need for these fast through-ways is indicated by the fact that in normal times about 90 per cent of the traffic on main highways near the entrances to large cities is bound to or from points within the cities and cannot be bypassed around them.

Other important new facilities required in an interregional system are belt-line distribution roads around the larger cities and alternate routes around many of the smaller cities and towns. The belt-line distribution roads will serve to bypass some through traffic. Their main purpose, however, is to distribute incoming and outgoing vehicles to points around the circumference of the city nearest their destinations.

Alternate routes for smaller cities serve a somewhat different purpose. To determine whether a route would be useful for a particular city, it is necessary to consider the volume of through traffic and the size of the city. Where a small city lies between nearby large cities, a route skirting the smaller city may be a great convenience to the through traffic, and may also reduce the traffic volume on the main city streets thereby relieving a troublesome condition.

Condensed from an article by Thomas H. MacDonald, Commissioner, Public Roads Administration, appearing in The American City, issue of February 1943.

OPERATIONS OF THE HOUSING, TRANSPORTATION AND RATIONING OFFICE, CURTISS-WRIGHT CORPORATION, COLUMBUS, OHIO

by D. H. Boggs

On several occasions we have been requested to outline the operations of our Housing, Transportation and Rationing Department. The following outline shows the various phases of operation and the different items coming under each phase. We sincerely hope that this outline will be of advantage to others.

Transportation

General personnel surveys. Securing information as to availability of automobiles, space in cars, age and condition of cars, shift work, etc.

Maintain share-the-ride file used to secure rides or riders for employees.

Take periodical traffic counts at gates to determine average load carried and percentage of changes.

Assist in securing buses. Maintenance and routes of buses. Assist in every way possible to create best possible service.

Visual tire inspection, paying particular attention to inflation and wheel alignment.

Arrange for the maintenance of employees' automobiles and assist in any way possible to expedite the repair work of such cars.

Secure titles for out-of-State cars, automobile license plates for out-of-State cars, secure drivers' licenses and arrange for drivers' examinations.

Rationing

Gasoline. Review all gasoline applications for accuracy and completeness. (Three-man reviewing committee detailed to take care of this operation. Their signatures as well as the transportation committee Chairman's is authorized at the rationing board.)

Tires. Accept tire applications. Assume the responsibility for inspecting the tire inspection record to determine whether full attention is being given to the repairing and recapping of tires. One way which this operation has been considerably relieved is that we have an identification for employees to take to the official tire inspectors who expedite the tire application.

Handle new car applications.

Bicycle applications.

Ration safety shoes. This office was provided with stamps for this purpose. For any other type of shoe, we fill out an application which the employee takes to the ration board for a new shoe certificate.

Furnish information relative to securing stoves and refrigerators for which applications are carried in the office.

Organize volunteer help throughout the plant to help issue food and gasoline rationing books.

An expeditor visits the larger boards (7 in number) in Columbus each day, depositing new applications, picking up issued books and tire certificates and clarifying any difficulties that arise.

Housing

List available houses, apartments and rooms and maintain a file.

Contact rental agencies and landlords.

Furnish station wagon service for out-of-town employees who are not familiar with the locality.

Information on F.H.A. loans and sale of homes.

Assist in the clarification of disputes between tenants and landlords through the medium of the Fair Rent Board.

Assist in housing welfare cases.

Arrange for gas and electricity to be

turned on in home rented to employees.

Member of executive war housing committee.

Lockers

Issue lockers to hourly paid employees who need this service.

Locks and chains to lock coats on coat hangers.

Supervise the maintenance of locker rooms.

Control locks, locks, and chains to be turned back to the Housing, Transportation and Rationing Office from departing employees.

Maintain master controls and permanent number file of employees to whom lockers are assigned as well as lock number file.

Lost and Found

Accept lost items turned into Housing, Transportation and Rationing Office.

Secure a record as to where the article was found and by whom and how the party can be reached.

Retain lost items for three weeks as required by the laws in the State of Ohio and if unclaimed return to finder.

Secure receipt from person to whom lost item is turned back.

Retain files of above operations.

Keep record of report on items lost and notify loser as item is found and turned into the department.

General

Secure and issue to employees various governmental forms such as income tax blanks.

Determine essentiality of employees requiring telephone service.

Assist in the selling of household goods and other items belonging to employees.

Furnish notary public service to employees.

Secure duplicate keys for plant when needed.

We give information and advice when able to, to all employees, especially where lost man hours may be involved. The department operates on the basis that we will do anything within reason to keep the employee on the job.

The department has three points of operation. One in the original building manned by eleven employees on the first shift and two each on the second and third shifts. Two operations in the new building. One to handle all items included in the above with the exception of lockers. Lockers are handled in the other point of operation in Building 3-A. All information clears through the main office in the original building.

An original article by D. H. Boggs, Transportation, Housing and Rationing Supervisor, Curtiss-Wright Corporation, Columbus, Ohio, Aug. 1943.

TIRE AND GASOLINE APPLICATION ERRORS

Type	1st Week	2nd Week
Signature Omitted	.07%	...
Serial No. of A Book Omitted	.07%	.04%
Tire Inspection Omitted	.04%	...
Need Recent Tire Inspection	1.1 %	2.8 %
Filed in Advance of Expiration Date	2.6 %	1.6 %
Requested Exorbitant Mileage	4.8 %	2 %
Needs Additional Riders	.04%	.04%
Changes of Address	.04%	.08%
Filed Application on Wrong Form	1.8 %	1.6 %
Total applications filed first week	267	13% error
Total applications filed second week	252	12% error

Note: A survey conducted for two weeks to disclose errors in filling out applications by employees at Curtis-Wright Corp.

FORD BOMBER PLANT ACCESSWAYS

by J. CARL MCMONAGLE

THE Ford Motor Company's announcement in February, 1941, that it would build four-motored Consolidated bombers by assembly line methods in a big new plant to be erected at Willow Run, marked a major step in the development of the Detroit defense program. It also confronted the State Highway Department with the responsibility for finding a solution to one of the most difficult and critical transportation situations which the defense effort developed.

It was to be a giant in size, in production, and in employment. Hailed as the largest industrial unit under one roof, its actual production schedule is, of course, a military secret. But rumor has persistently set the ultimate schedule at one hard-hitting bomber every hour of the day and night.

But it takes more than the world's biggest plant to build a bomber an hour. It takes men—skilled men—eventually a hundred thousand of them; and it takes materials and parts. To get those men and materials onto the assembly lines, it takes transportation—in this case highway transportation.

Location made transportation the chief operation problem at Willow Run. For the site selected for the giant bomber plant was in rural territory, 25 miles from its only adequate source of labor in Detroit.

Adequate highways were the key to the Willow Run labor problem, but the State Highway Department's engineers knew that such highways did not exist; they would have to be produced. The plant location was served by antiquated roads and the state trunklines connecting it with Detroit were already congested by their normal traffic. So the Department set about the task of planning and then of building new roadways and structures.

There were two distinct phases of this problem: transfer facilities at the plant, and highway connections with Detroit.

Plans for the roads and structures at Willow Run necessarily had to provide for the surges of maximum traffic which would occur during the shift changes when the plant reached full production. It was estimated that under those conditions 32,000 workers would be coming to or leaving Willow Run in each movement and that they would use 140 buses and 8,330 passenger cars. Normal travel on the highways involved was estimated at 2,530 vehicles per hour.

Thus, in the hours of peak traffic a total of 8,400 vehicles per hour would have to be accommodated on the facilities connecting the plant parking yard with the highways of the area. The hourly volumes on the latter arteries would be 11,000 vehicles.

Plans for the highways leading from the plant area to the workers' home communities were influenced by the fact that existing routes were heavily burdened with important trunkline traffic. Moreover, consideration had to be given to the fact that the all-important route to Detroit passed through the Dearborn area where its traffic was forced to make its way through the periodical movements of workers in and out of the great Ford plant at River Rouge.

In general outline, the plan adopted to meet these complex requirements comprised transfer structures at the Willow Run plant gates, a collection and distribution belt around three sides of the plant property, a by-pass south of Ypsilanti to provide access from

the West, and the connecting expressway to Detroit. To permit free movement through the congestion traversed by the latter route, the Department adapted and utilized its plans for the southwest extension of the Detroit Industrial Expressway. The whole project involved the construction of 45 miles of expressway, most of it limited access design, and 53 bridge, separation, and transfer structures, of which two were of novel tri-level type.

The use of the tri-level type of grade separations was dictated by the basic design principle adopted for most of the expressway system. This is the principle of directional transfer. The means used to instrument this principle and the fact that the resulting roadways have a safe and efficient hourly capacity of 1,500 vehicles per lane, are the outstanding features of the Willow Run expressways.

The need for speedy and uninterrupted movement of worker traffic between the plant and their distant homes, made necessary a limited access design. This of course meant the separation of grades at all intersections. But study of the estimated traffic volumes and of the sharply peaked pattern of their occurrence convinced traffic and design engineers that the ordinary clover-leaf system of interchanges at these points would confuse drivers and make free flow difficult.

Except under special local conditions, therefore, the roadways at transfer points are so arranged as to permit normal turning maneuvers; that is, a driver turns to the right or left in the actual direction of his route. This treatment entailed several departures from routine design and traffic practice. It also resulted in certain conditions which should be welcome in the field of highway construction and operation.

Directional design calls for an arrangement of transfer roadways different from that hitherto used. On the clover-leaf type of separation, all changes in the direction of traffic are provided for outside the lines of the intersecting highways. In the case of directional interchanges, left turns are ordinarily carried on transfer roads placed between the roadways of the arteries involved.

The normal width of the dividing strip as adopted for the Willow Run Expressways is 164 feet. But at important intersections this width is increased to as much as 875 feet. The space between the roadways at these intersection points is an important factor in determining the design speed of the interchange roads. On these expressways, interchanges are designed for a maximum speed of 35 miles per hour.

This speed is relatively high for roadways serving an interchange function. It is an example of one of the two classes of design features whose objective is to get the fullest benefits from this treatment of the transfer problem at intersections with separated grades. The first class aims to render transfer maneuvers as simple and rapid as possible. The aim of the second class of design features is to protect traffic and make the operation smooth and safe.

The emphasis placed on transferring traffic is due to the belief that time gained by careful planning on the straightaways should not be consumed by delays at turns. The Detroit Industrial Expressway section of this access road system is designed for safe travel at speeds up to 100 miles per hour.

Curves and grades are held within narrow limits with the express roadways passing through separations on a flat grade. To guard against constriction of the traveled way, the full 12-foot shoulders are carried right over all bridge structures.

As far as possible, these speed characteristics are extended to the transfer structures and roads. One feature which contributes to the 35-mile per hour maximum speed on the transfer roadways is the 3½ per cent grade limit for all ramps. And this speed characteristic is not wasted by enforced stops at points where transfer roads enter the intersecting highway.

To obviate the necessity of halting vehicles before merging in the main line traffic stream, several safety features were designed into both the interchange and trunkline pavements. For one thing, traffic is funnelled through the transfer road to prevent the possibility of two cars entering the primary artery abreast. This is done by gradually narrowing the two lanes with which the transfer road takes off from one highway to a single line before it swings into the other highway.

Deceleration and acceleration lanes are provided at the entrances to and exits from all transfer roads. Where intersecting roads are closely spaced, these auxiliary lanes become a continuous added lane.

Closely related to this treatment of acceleration and deceleration lanes is the somewhat novel device employed where very large volumes enter the expressway — such locations as are found on the Willow Run access system, at the gates of the bomber and the River Rouge plants. To meet such conditions, an ample number of lanes are specified to provide a merging area of such width and length as will permit the safe and orderly organization of the expanded traffic stream.

There is one further characteristic feature of directional interchange that deserves a word of comment and explanation. That is its utilization of the left-hand lane for certain turn-off and merging operations.

Since it has been customary to think of this as the "high speed lane" because it is used by the over-taking car in a passing maneuver, this treatment may seem somewhat unusual. But, as a matter of fact, by far the greater proportion of traffic on every directional traffic pavement uses the lane or lanes to the right.

We know that in Michigan, drivers make this logical preponderant use of the right hand lane. They may be unusual in this respect, but I do not think so.

Unquestionably, the employment of the left hand lane for transfer purposes demands certain special safeguards. It is believed that such devices as the concrete and parallel transfer lead-in and generous sight-distance provide adequate protection against the special traffic relationships which this use creates.

The traffic which the Willow Run system was built to serve not only flows at high volume; it is a very complex movement. The roadways and structures were designed to handle this movement in the simplest and most direct manner possible. Nevertheless, any system of this kind requires that traffic be directed so that the most efficient use shall be made of the facilities. For that reason, the signing at Willow Run was given very careful consideration.

Both in placement and type, the expressway signs are modern, and, we believe, effective. Priority problems prevented the over-the-roadway installation of directional signs which was originally planned. But, although all these driver aids are not conventionally at the side of the pavement, they are designed to meet the needs of expressway traffic.

The lettering as well as the sign itself, have been increased in size and the type of letter has been improved to secure greater legibility.

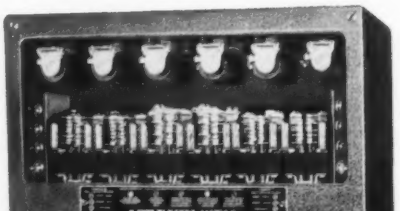
Condensed from a paper given by J. Carl McMonagle, Planning and Traffic Engineer, Michigan State Highway Department, at the 21st Midwest Safety Conference, Chicago, Ill., May 1943.

≡ *SUPER* ELECTRO-MATIC ≡

Moves

WAR TIME TRAFFIC

MAXIMUM



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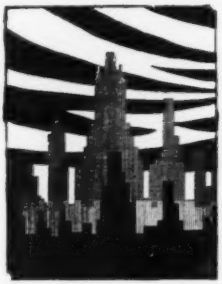

Stop, Look and Listen

PERSONALS

LEWIS W. MCINTYRE (Mem. I.T.E.), Consulting Engineer, Pittsburgh, Pa., was recently appointed to the rank of Major in the Provost Marshal's Department, U. S. Army. Address mail to the Major care of Miss Elizabeth McIntyre, 7118 Cord Lane, Pittsburgh, Pa.

JAMES E. P. DARRELL (Assoc. I.T.E.), formerly Assistant Traffic Engineer for the Minneapolis State Highway Department, was commissioned on June 5, 1943, Captain Darrell, and has been assigned to the Sixth Transportation Zone, Chicago, as Highway Traffic Engineering Officer. The Sixth Transportation Zone is one of the nine zones formed by the Transportation Corps under the direction of Major General C. P. Gross, Chief of Transportation.

A. WALLACE GOVE (Assoc. I.T.E.), formerly City Traffic Engineer, Bureau of Engineering, City Hall, Worcester, Mass., has been commissioned First Lieutenant in the U. S. Army. Lieutenant Gove has recently departed for training for his new post.

HOW WOMEN DRIVERS AFFECT EMPLOYEE TRANSPORTATION

Surveys conducted by the Traffic and Transportation Division of the National Conservation Bureau reveal that only 8 percent of women war workers drive cars to work whereas among men 42 percent drive their cars to work.

Industrial analysts reveal that when 100 women in war work replace an equal number of men, the equivalent of 30 or 40 passenger cars are withdrawn from service as an essential medium for transporting war workers.

This emphasizes the serious employee transportation problems that exist in those plants that anticipate hiring large numbers of women employees.

V-SCOPES

The Virginia Highway Department is making good use of the L-shaped boxes developed by the Eno Foundation for Highway Traffic Control, Inc. of Westport, Conn. for checking the speeds of motor vehicles on highways. These L-shaped boxes sometimes known as Enoscopes but dubbed V-scopes by the Virginia highway engineers and Department of State Police, have been accepted by county trial justices and are from all reports, very effective in causing a steady decrease in speed violations. The state troopers are enthusiastic. No cases based on the use of the V-scopes have been dismissed and the State Highway Department Planning Board is obtaining some very valuable data for use in future planning and design.

PLACING STOP SIGNS IN RURAL AREAS

Several years ago the Virginia Department of Highways had a great deal of trouble with the effectiveness of stop signs on the highways.

It was a general practice to erect a stop sign on the right shoulder of the secondary road at a distance of from one to three hundred feet from the edge of the preference road, depending upon the grade and the length of sight distance approaching the preference road. Vehicles were supposed to stop near the edge of the surface of the preference road before entering. Usually the intersection was constructed or surfaced with large turning radii, resulting in a very large area in the intersection, which permitted traffic to leave or enter the secondary road at a fairly high speed. The motorist could comply with the sign by stopping at the sign two hundred feet from the preference road and then entering the preference road at possibly twenty-five to thirty miles per hour, and in some cases at greater speeds, particularly at those intersections where the secondary road intersects the preference road at less than ninety degrees.

Motorists were continually disregarding stop signs by failing to see them or by failing to appreciate their value.

From a study of a number of intersections, it was determined that the stop sign should be erected at the point where the vehicle should stop, that adequate sight distance should be provided to the sign, that the area of the intersection should be reduced as much as possible, that traffic should be channelized into the intersection, and that adequate sight distances should be provided in both directions on the preference road.

This was accomplished by reducing turning radii to a minimum, if necessary, relocating and rebuilding the intersection to make the secondary road intersect the preference road as nearly as possible at a right angle, then placing the stop sign in the center of the secondary road about three feet off the edge of the surface of the preference road. In most cases, the stop sign is protected by white posts with reflector buttons and in others by "tear drop" islands.

The results obtained from placing the stop sign at this location have been found to be very satisfactory. Drivers have been observing the signs much better as they cannot miss seeing them. The State Police say it is much easier to get a conviction in case of a violation; and motorists also say they like the new erection much better.

The only disadvantage to this system is the fact that frequently a sign and protecting posts are knocked down or otherwise damaged, but this damage is of little consequence, since the effectiveness of the signs is so greatly increased. Stop signs and all other signs are a waste of money unless they answer the purpose for which they are erected.

Contributed by Giles M. Robertson, Richmond, Va.

WISCONSIN SPEEDS

Wayne N. Volk, Traffic Engineer of Wisconsin, reports that traffic speeds checked in July in that State have not greatly increased in the past few months except a very sharp drop was recorded in the number of cars exceeding 55 miles per hour.

Two-thirds of the motorists on rural Wisconsin highways drive in the ten-mile per hour range from 35 m.p.h. to 45 m.p.h The average speed is increasing although still ten miles per hour less than during normal times.

FOR A BETTER UNDERSTANDING

JUNE 1943 marked the date of the first issue of *Transportation Committee Bulletin* by the Office of Price Administration. This publication should do much to clarify the need for car conservation and its relation to a sound rationing program.

Write the Gasoline Rationing Branch Office of Price Administration, Washington, D. C. for future issues.

TRANSPORTATION COMMITTEES COORDINATE ALL FACILITIES SERVING THEIR PLANTS

Relationship of Car-sharing and Public Transportation Clarified

In efforts to more efficiently coordinate and guide plant transportation committees, the Office of Price Administration has established a clear-cut policy for home-to-work travel under the Mileage Rationing Program.

Faced with increasing shortages of rubber and transportation equipment, the easy-to-follow principles take into consideration the importance of getting essential workers to their jobs while conserving critical materials.

Briefly the principles are:

1. Transportation facilities not employing rubber must be used to capacity.

2. Emphasis must be placed on car-sharing—passenger cars traveling with full loads of workers—rather than on bus travel. There are still enough automobiles and tires for necessary travel, but buses are critically short. Bus tires require large amounts of crude rubber, while automobiles can be operated on recaps of reclaimed rubber, on pre-war tires and on tires using a small amount of crude rubber.

3. In instances where buses have to operate, they must be used to capacity.

Also established is the procedure for the issuance of home-to-work mileage when various types of public transportation are involved.

SUBWAY, ELEVATED, RAIL COMMUTATION

Regardless of the number of riders, supplemental rations are to be denied those who are able to use these services.

STREET CARS, FERRIES

Drivers having less than 3 passengers and able to use street cars or ferries must be denied supplemental mileage.

Drivers with 3 or more passengers may be granted supplemental mileage regardless of the availability of street cars or ferries unless these services have been determined as having unused capacity by the Regional Administrator or Deputy Administrator in charge of Rationing. Upon such determination, an order designating this service as adequate will be issued and drivers with 3 or more passengers are to be denied supplemental mileage if these services can be used.

BUSES

Drivers having less than 3 passengers and able to use buses must be denied supplemental mileage.

Drivers with 3 or more passengers may be granted supplemental mileage regardless of the availability of buses unless this service has been determined as necessary with unused capacity. Upon such determination, drivers with 3 or more passengers are to be denied supplemental mileage if this service can be used. As in the case of street cars and ferries, rations will be granted to drivers of full cars until specific order designating adequacy is issued.

OPA DETERMINES ADEQUACY OF PUBLIC TRANSPORTATION

Important factor in issuance of supplemental mileage

While the present regulations provide that subway, elevated or rail commutation services must be considered as adequate means of transportation,

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SAFETY DEVICES FOR TRAFFIC

other forms of public transportation may now also be considered adequate upon determination by the Office of Price Administration.

Determination is to be made by the Regional Administrator or Deputy Administrator in Charge of Rationing and includes such other public transportation services as street cars, buses and ferries. After being determined adequate, a designation order will be issued after a thorough investigation of the area.

Supplemental mileage is not to be issued to drivers able to use subway, elevated or rail commutation service even though they have full car clubs. Rations may be issued if the drivers carry 3 or more passengers, when other types of transportation services are available, unless this service has been designated as adequate. Rations may then be denied to those able to use these services regardless of the number of riders.

If it is found that street cars or ferries can be used, and offer reasonable service, such an order will usually be issued.

Considerable more information is necessary before a designation order may be issued for bus service. No more buses will be ordered filled than are necessary to carry workers without cars and unable to form car clubs, to provide a reasonable service and a practicable operation. Buses not needed may then be transferred to areas where such service is necessary.

When a Transportation Committee knows of an instance where public transportation is not used to capacity, it should notify the nearest OPA Office.

Rubber Director Says Next 4 to 6 Months Critical

Report stresses need for rubber and tire conservation continues

Stating emphatically "the rubber problem has not yet been completely solved . . . the next four to six months will be the critical period," William M. Jeffers released his Third Progress Report of the Rubber Program on May 17, 1943.

Wide use of the facts in this report is recommended for transportation committees, to combat the recent optimistic rumors and statements which have raised some questions about the need of gasoline rationing, car-sharing and other measures to save mileage and rubber.

Among the clarifying statements in this report are: " . . . every American must realize that except for essential necessities, rubber cannot become a generally available commodity for a long time, and that extensive conservation of tires and other rubber products *must still be continued.*

"The most important and largest inventory of rubber in existence is in the tires of passenger cars. A recappable carcass is a net saving since a new tire need not be issued . . . Freeing recaps from rationing is a positive conservation measure which extends the life of tires now on passenger cars.

"New tires will be issued only to essential drivers . . . Upon the local ration boards is placed the responsibility of seeing that only essential drivers get new tires . . . only when existing ones are no longer usable or recappable.

"By 1944 the country will have gone two years with less than one quarter of the normal replacement of tires and with no new cars . . . new tires must be provided to keep the country moving. Surveys show that 30,000,000 is the probable minimum replacement program that the country can get by with, even by general recapping, by maintenance of present driving speeds, and by keeping present conservation measures.

"It cannot be denied that this country moves on rubber, and it's a military necessity to keep the country's transportation system alive.